Application of TWI (Training Within Industry) in Supply Chain Management

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ABSTRACT

Supply Chain Integration is greatly considered by Organizations as it highly contributes towards the efficiency of their Supply Chains. Integration is both internal as well as external. Organizations by setting up performance standards are achieving the internal integration while external integration still seems to be a challenge. It requires building up of standards with different partners in the supply chain which calls up on organizational and cultural changes among firms. Researchers identify the requirement for a successful industrial initiative while many existing ones have no definite standards and are hard to implement.

For building such an initiative or framework this paper exhibits a possibility to extend the use of a program called Training within Industry (TWI) to the value chain which evolved in 1940's during World War two to increase production output to support the Allied Forces war effort. Four program modules of TWI Job Methods (JM), Job Instruction (JI), Job Relations (JR) and Program Development and their relevance to achieve Supply Chain External Integration on sustainable basis is discussed in detail. A hypothesis is proposed on implementing TWI for supply chain external integration to achieve it on sustainable basis.

Introduction

Supply Chain View of Organizations gained greater importance in recent decades as it has changed the way the Organizations compete, which is rightly quoted by (S. Li, 2002) as "Competition is no longer between organizations, but among supply chains". Supply Chains encompasses all activities that are associated with the flow and transformation of goods from the raw materials stage, through to the end user, as well as associated information and fund flows through ***efficient integration*** of suppliers, manufacturers, warehouses, transporters, retailers and customers (L. Li, 2007). Efficient Integration of supply chain channels contributes towards Organization's Performance (Lummus & Vokurka, Robert J Krumwiede, 2008; Zailani & Rajagopal, 2005) but in reality it is rarely achieved.

Integration is both internal which is about coordinating flow of materials, information and funds across boundaries of different departments within an organization and external integration is about coordinating different organizations in the supply chain. Both internal and external

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Integration contributes towards efficiency of the organizations as identified by various researches (Patricia & Timothy, 2009; Topolsek, Lipicnik, & Gajsek, n.d.; Trkman, Štemberger, Jaklic, & Groznik, 2007) while external integration is less focused when compared to internal integration.

Research study by (Fawcett & Magnan, 2002) identifies that primary integration focus of 60% of the organizations was only on internal integration. Less focus over external integrations is due to existence of various difficulties in integrating different firms in the supply chain (Rhonda R. Lummus, S. Melnyk, R. Vokurka, L. Burns, 2007) who operate with diverse cultures. In case of internal integration performance measures can be set by the top management to ensure internal consistency but such measures cannot be set by a firm on other for the purpose of external integration which would rise power conflicts but standards can be set and ensured as such they make sense for both the parties claims (Shah, 2009).

Various initiatives like Vendor Managed Inventory (VMI), CPFR (Collaborative, Planning, Forecasting and Replenishment), ECR (Efficient Customer Response) exists for organizations to enhance external integration but none has standardized procedures and are difficult to implement as they require ***organizational and cultural changes.*** A new initiative or framework with a possibility for setting up standards for enabling positive cultural changes among different organizations seems to be the industry requirement (Rhonda R. Lummus, S. Melnyk, R. Vokurka, L. Burns, 2007) for ***which this paper exhibits a possibility to extend a program called TWI to the value chain and attain a most challenging end-to-end supply chain integration.***

What is TWI?

Training within Industry (TWI) is a unique program developed in USA during World War II to tackle the shortage of trained and skilled workers to do production jobs while industry trained personnel were moved to war fronts. Necessity for such a program seemed to be a high requirement where

- production of defense materials to be increased at the rapid phase with available resources
- training time to be reduced invariably while ensuring standardization

TWI was a boon to US Organizations during the time where its implementation had greater impact on their production which was doubled over the period of over 2 years. The below Table 1.1 shows the results collected by TWI during the course of war (1943-1945)

Table 1.1 : TWI Productivity Results (1943-1945)

	Percentage of Plants Reporting Results of 25 Percent and Over						
	May 1943	Sep 1943	Feb 1944	Nov 1944	April 1945	July 1945	Sep 1945
Production increased	37	30	62	76	64	63	86
Training time reduced	48	69	79	92	96	95	100
Manpower saved	11	39	47	73	84	74	88
Scrap loss reduced	11	11	53	20	61	66	55
Grievances reduced	(Not reported)		55	65	96	100	100

Source**:** (Huntzinger, 2007)

Beyond the production rise which exceeded the expectations TWI has brought in an unseen advantage where it helped organizations to build, sustain and take control of its culture which is quite rare to achieve, through its well managed program modules.

TWI Program Modules

Job Instruction, Job Relations, Job Methods and Program Developments are the four modules of TWI which are discussed below briefly.

Job Instruction helps to gain stability in an operation, by solving problems involving people. It is a four step plan on "How to instruct" which should be created by the supervisors to train employees on the job. The four key steps are Prepare the worker, Present the operation, Try out performance and Follow up. Results of Job Instruction seem to achieve the following (Lund, 2007) while ensuring standardization over jobs and training.

- Reduction in defect over 70%
- Reduction in cost exceeding 30%
- Increased Productivity exceeding 50%
- Improved employee retention
- Improved shop floor communication
- Improved Safety
- Culture of Change

The below Picture 1.1 depicts the typical Job Instruction card and the steps in detail

Picture 1.1 Job Instruction Card

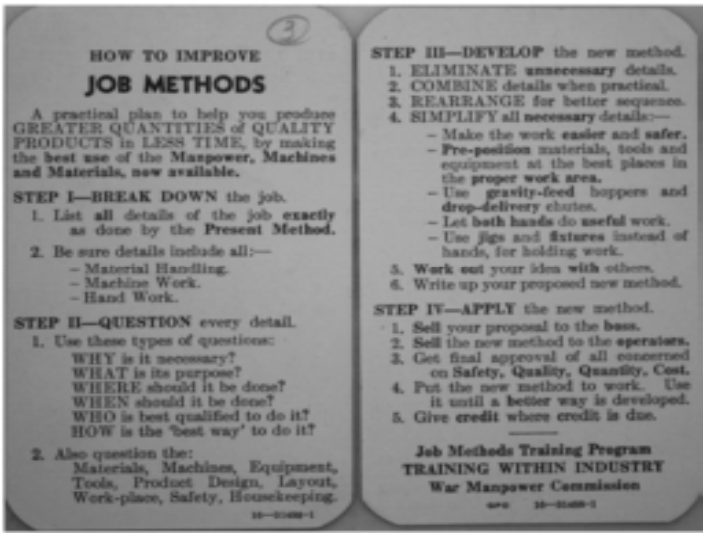
Source**:** (Huntzinger, 2007)

Job Methods aims improvements in the work area using a practical approach instead of a technical approach by the supervisor to have a plan to produce greater quantities of quality products in less time by making the best use of the manpower, machines and materials that are currently available. This is again a four step method which are Break down the Job, Question every detail, Develop the new method and Apply. Aim of the program is to ensure that supervisor is not instructing an idea that is incomplete or flawed. Results of Job Methods helped supervisor to

- Discover Improvements through standardization
- Have a feasible solution before applying
- Ensures best practices are followed
- Continuous Improvement

The below Picture 1.2 depicts the typical Job Instruction card and details steps

Picture 1.2 Job Methods Card



HOW TO IMPROVE

JOB METHODS

A practical plan to help you produce GREATER QUANTITIES of QUALITY PRODUCTS in LESS TIME, by making the **best use** of the **Manpower, Machines and Materials, now available.**

STEP I—BREAK DOWN the job.
1. List **all** details of the job **exactly** as done by the **Present Method.**
2. Be sure details include all:—
   – Material Handling.
   – Machine Work.
   – Hand Work.

STEP II—QUESTION every detail.
1. Use these types of questions:
   WHY is it necessary?
   WHAT is its purpose?
   WHERE should it be done?
   WHEN should it be done?
   WHO is best qualified to do it?
   HOW is the "best way" to do it?
2. Also question the:
   Materials, Machines, Equipment, Tools, Product Design, Layout, Work-place, Safety, Housekeeping.

STEP IIB—DEVELOP the new method.
1. ELIMINATE **unnecessary** details.
2. COMBINE details when practical.
3. REARRANGE for better sequence.
4. SIMPLIFY all **necessary** details:—
   – Make the work **easier** and **safer.**
   – **Pre-position** materials, tools and equipment at the best places in the **proper work area.**
   – Use **gravity-feed** hoppers and **drop-delivery** chutes.
   – Let **both hands** do **useful** work.
   – Use **jigs** and **fixtures** instead of hands, for holding work.
5. **Work out** your idea **with** others.
6. Write up your proposed new method.

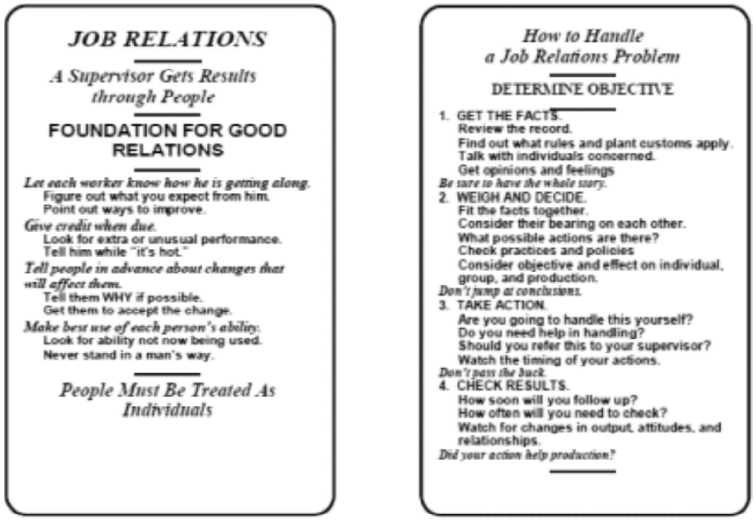
STEP IV—APPLY the new method.
1. **Sell** your proposal to the **boss.**
2. **Sell** the new method to the **operators.**
3. Get final approval of all concerned on **Safety, Quality, Quantity, Cost.**
4. Put the new method to work. Use it until a **better** way is developed.
5. Give **credit** where credit is due.

Job Methods Training Program
TRAINING WITHIN INDUSTRY
War Manpower Commission

Source**:** (Huntzinger, 2007)

Job Relations program is to ensure that the small issues related to employees are well understood and resolved before they become bigger issues by the supervisor. It helped supervisors to learn and acquire leadership skills thereby efficiently addressing morale issues or grievances among people. Job Relations has again four steps and they are Get the facts, Weigh and Decide, Take action and Check results. The below picture 1.3 depicts how a typical Job Relations card instructions and the steps on it.

Picture 1.3 Job Relations Card



JOB RELATIONS

A Supervisor Gets Results through People

FOUNDATION FOR GOOD RELATIONS

Let each worker know how he is getting along.
Figure out what you expect from him.
Point out ways to improve.

Give credit when due.
Look for extra or unusual performance.
Tell him while "it's hot."

Tell people in advance about changes that will affect them.
Tell them WHY if possible.
Get them to accept the change.

Make best use of each person's ability.
Look for ability not now being used.
Never stand in a man's way.

People Must Be Treated As Individuals

How to Handle a Job Relations Problem

DETERMINE OBJECTIVE

1. GET THE FACTS.
   Review the record.
   Find out what rules and plant customs apply.
   Talk with individuals concerned.
   Get opinions and feelings
   Be sure to have the whole story.
2. WEIGH AND DECIDE.
   Fit the facts together.
   Consider their bearing on each other.
   What possible actions are there?
   Check practices and policies
   Consider objective and effect on individual, group, and production.
   Don't jump at conclusions.
3. TAKE ACTION.
   Are you going to handle this yourself?
   Do you need help in handling?
   Should you refer this to your supervisor?
   Watch the timing of your actions.
   Don't pass the buck.
4. CHECK RESULTS.
   How soon will you follow up?
   How often will you need to check?
   Watch for changes in output, attitudes, and relationships.
   Did your action help production?

Front and Back of the Job Relations Card

Source**:** (Huntzinger, 2007)

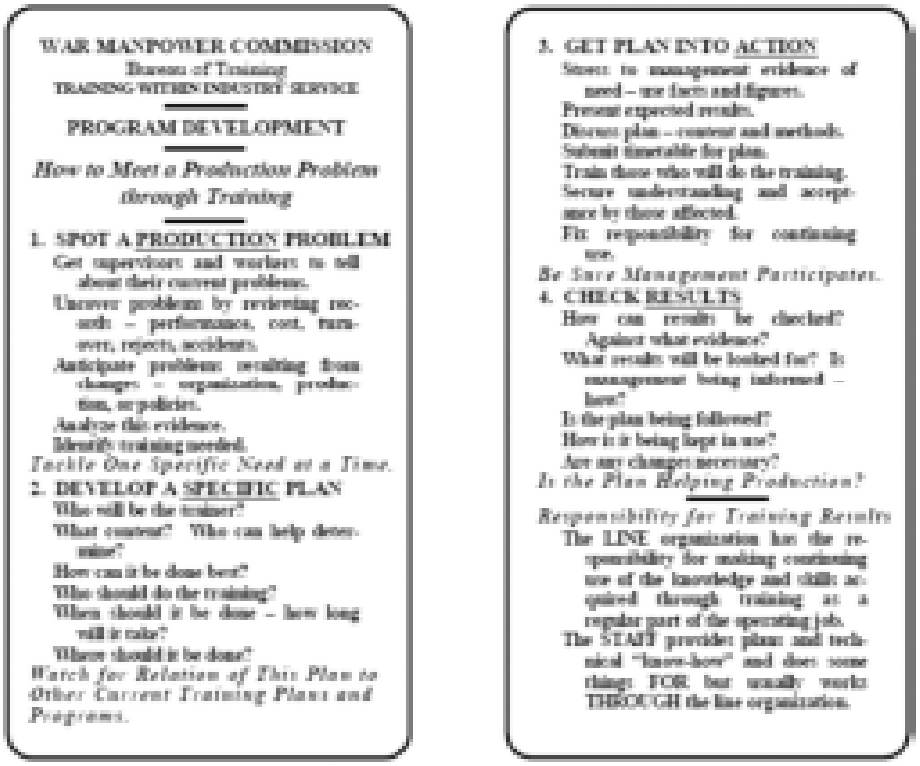
Program Development

Program Development is the last module in TWI which is for TWI Training coordinators to help organizations set up and administer TWI in their plants with their own people and also to meet a production problem through training plans. Program is more unique and efficient which is developed after getting inputs of various industry experts rightly called "for industry by industry". As the standard of TWI programs to have four step plans Program development has four steps like 1) Spot a production problem 2) Develop a scientific plan 3) Get plan into action 4) Check results.

Program Development ensures quality from all sides and efficiently addresses the objective of business to produce a product or service at right quality delivered at right time at possible low cost also ensuring safety. The typical Program development card looks as shown in the below picture 1.4

Picture 1.4 Program Development Card

Four discussed program modules provide an efficient approach for standardization (Job Instruction), problem solving (Job Relations, Program Development), skill and culture development (Job Instruction, Job Methods, Job Relations) within organization while ensuring continuous improvement (Job Methods).



WAR MANPOWER COMMISSION
Bureau of Training
TRAINING WITHIN INDUSTRY SERVICE

PROGRAM DEVELOPMENT

How to Meet a Production Problem through Training

1. SPOT A PRODUCTION PROBLEM
   Get supervisors and workers to tell about their current problems.
   Uncover problems by reviewing records – performances, cost, turnover, rejects, accidents.
   Anticipate problems resulting from changes – organization, production, or policies.
   Analyze this evidence.
   Identify training needed.
Tackle One Specific Need at a Time.
2. DEVELOP A SPECIFIC PLAN
   Who will be the trainer?
   What content? Who can help determine?
   How can it be done best?
   Who should do the training?
   When should it be done – how long will it take?
   Where should it be done?
Watch for Relation of This Plan to Other Current Training Plans and Programs.

3. GET PLAN INTO ACTION
   Show to management evidence of need – use facts and figures.
   Present expected results.
   Discuss plan – content and methods.
   Submit timetable for plan.
   Train those who will do the training.
   Secure understanding and acceptance by those affected.
   Fix responsibility for continuing use.
Be Sure Management Participates.
4. CHECK RESULTS
   How can results be checked? Against what evidence?
   What results will be looked for? Is management being informed – how?
   Is the plan being followed?
   How is it being kept in use?
   Are any changes necessary?
Is the Plan Helping Production?

Responsibility for Training Results
The LINE organization has the responsibility for making continuing use of the knowledge and skills acquired through training as a regular part of the operating job.
The STAFF provides plans and technical "know-how" and does some things FOR, but usually works THROUGH the line organization.

Source**:** (Huntzinger, 2007)

Possible Universal Application of TWI

TWI modules which were successful to such a great extent in US Organizations and later on in Japan ***satisfy the condition required for any universal application training program namely***

Simplicity: TWI program methods are very simple, are easy to understand and implement (Huntzinger, 2007). Each program is a four step method with clear instructions over what is to be done and by whom with defined standards. The time required to build and train the program is just 70 hours for any kind of organization.

Scientific Basis: It is important for the method to have a scientific basis for it to question or replicate (Dinero, 2005). TWI programs are scientific which includes the principles of good management that can be readily adopted. The following Table (1.2) shows steps in scientific method and in TWI.

Table 1.2 : Steps in Scientific Method and in TWI

Steps in the Scientific Method	Steps in Management Principles used by TWI
1. Observation: Define the Problem and its parameters.	1. Define an objective or a problem and translate this into operation terms.
2. Hypothesize: Suggest a possible explanation or solution.	2. Gather Facts
3. Testing: Collect information (data) and test hypothesis.	3. Analyze the facts
4. Results: Interpret the results of the test to determine if hypothesis is correct	4. Make and implement a decision
5. Conclusion: State a conclusion that others can independently evaluate	5. Test or check the result

Source: (Dinero, 2005)

Multiplier Effect

TWI follows Multiplier effect (Huntzinger, 2007) which is about developing standard method then train the people who in turn train others and they in turn train repeated groups of people. It is how TWI was spread throughout USA during war time to meet the production requirements with available resources and proved to be a great success.

Here there is no reason why their relevance to the Supply Chain, which in reality is just an extended value chain.

TWI in Supply Chain Management

Focus of TWI program modules were limited to individual organizations which in turn increases the responsibility of the focal firm to promote and sustain the implementation of these programs with its partners who may operate with different culture. The success of such an effort is clearly visible on seeing the Japanese supply chains which focuses over trust-based relationships (Shah, 2009) where benefits are long term and are sustainable rather than power based relationship where stronger party exploits the weaker one. This can be articulated by seeing the supply chains of Toyota and Hitachi which are hailed to be world class (Hines, 1994).

All the Japanese companies were forced to implement TWI by the occupational American forces lead by **General Douglas MacArthur** while this resulted in amazing rise in productivity (Handyside, 1997) and unnoticed benefit also followed. This happened to be a supply chain wide proliferation of TWI. This meant that partners where closely connected with each other hence resulting in the concept of ***Kyoryouku kai*** (Hines, 1994) which means close long term relationship with suppliers which results in amazing level of external supply chain integration. This has never been replicated by another other firm across the world which clearly points to invaluable contribution of TWI towards SC Integration.

Conclusion

With no existence of any viable initiative or frameworks for organizations to achieve external integration efficiently TWI programs can be an effective solution to attain it on a sustainable basis. External Integration between organizations as discussed requires cultural change and standard guidelines for which greater possibility is seen in TWI program modules.

Hence we put forth the following proposition based on above discussions

H1: If a supply chain has to achieve external integration on sustainable basis implementation of TWI can lead to wonderful results.

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